CLAIMS

1. Apparatus for providing dimming control of an electrical lamp of the type driven by a ballast that is provided between an AC supply and the lamp, comprising means located in series between the AC supply and the ballast for inserting an auxiliary voltage, said auxiliary voltage being out of phase with said AC supply, whereby the supply voltage is the vectorial combination of the voltage applied to the ballast and the auxiliary voltage, such that the magnitude of the voltage applied to the ballast is smaller than the magnitude of the voltage of the AC supply, and further comprising means for controlling the auxiliary voltage for varying the voltage applied to the lamp, wherein the phase of the auxiliary voltage is maintained 90 or 270 degrees out of phase with the current flowing through said apparatus, and wherein the magnitude of the auxiliary voltage is used for varying the voltage applied to the lamp.

2. Apparatus as claimed in claim 1 wherein said means for inserting an auxiliary voltage comprises a power converter for generating said auxiliary voltage.

3. Apparatus as claimed in claim 2 wherein said power converter comprises a half-bridge inverter comprising two switches that are switched at high-frequency to generate a pulse-width-modulated (PWM) waveform as an output.

4. Apparatus as claimed in claim 3 wherein the PWM output of said half-bridge inverter is filtered to provide said auxiliary voltage.

5. Apparatus as claimed in claim 3 further comprising means to select a desired DC link voltage for the half-bridge inverter in order to control the magnitude of the auxiliary voltage.

6. Apparatus as claimed in claim 5 further comprising means to maintain said DC link voltage at said desired value.

7. Apparatus as claimed in claim 6 wherein a closed loop control scheme is used for maintaining said DC link voltage at said desired value and for maintaining the phase of said auxiliary voltage 90 or 270 degrees out of phase with said current.

8. Apparatus as claimed in claim 2 wherein said power converter comprises a full-bridge inverter.

9. Apparatus as claimed in claim 1 further comprising switch means whereby said apparatus may be by-passed if dimming control is not required and the voltage of the AC supply is applied directly to the ballast.

10. An electrical lighting system comprising at least one lamp connected to an AC supply through a ballast, said system further comprising means for providing dimming control of said at least one lamp, said dimming control means comprising means located in series between the AC supply and the ballast for inserting an auxiliary voltage, said auxiliary voltage being out of phase with said AC supply, whereby the supply voltage is the vectorial combination of the voltage applied to the ballast and the auxiliary voltage, whereby the voltage applied to the ballast has a magnitude that is smaller than the magnitude of the voltage of the AC supply, and further comprising means for controlling the auxiliary voltage for varying the voltage applied to the lamp, wherein the auxiliary voltage is maintained at 90 or 270 degrees out of phase with the current flowing through said dimming control means, and wherein the magnitude of the auxiliary voltage is used for varying the voltage applied to the lamp.

11. A system as claimed in claim 10 wherein said dimming control means comprises a power converter for generating said auxiliary voltage.

12. A system as claimed in claim 11 wherein said power converter comprises a half-bridge inverter comprising two switches that are switched at high-frequency to generate a pulse-width-modulated (PWM) waveform as an output.

13. A system as claimed in claim 12 wherein the PWM output of said half-bridge inverter is filtered to provide said auxiliary voltage.

14. A system as claimed in claim 12 further comprising means to select a desired DC link voltage for the half-bridge inverter in order to control the magnitude of the auxiliary voltage.

15. A system as claimed in claim 14 further comprising means to maintain said DC link voltage at said desired value.

16. A system as claimed in claim 15 wherein a closed loop control scheme is used for maintaining said DC link voltage at said desired value and for maintaining the phase of said auxiliary voltage 90 or 270 degrees out of phase with said current.

17. A system as claimed in claim 11 wherein said power converter comprises a full-bridge inverter.

18. A system as claimed in claim 10 further comprising switch means for bypassing said dimming control means if dimming control is not required and the voltage of the AC supply is applied directly to the ballast.

19. A system as claimed in claim 10 wherein said ballast is a magnetic ballast.

20. A system as claimed in claim 10 wherein said ballast is an electronic ballast of the type that enables a light to be dimmed by reduction of the AC input voltage to the ballast.

21. A system as claimed in claim 10 wherein said at least one lamp comprises a plurality of lamps.

22. A method for providing dimming control of an electrical lamp driven by a ballast, comprising inserting an auxiliary voltage between an AC supply and said ballast, said auxiliary voltage being out of phase with the voltage of said AC supply whereby the supply voltage is the vectorial combination of the voltage applied to the ballast and the auxiliary voltage, wherein the auxiliary voltage is maintained 90 or 270 degrees out of phase with the current supplied to the ballast.

23. A method as claimed in claim 22 wherein the auxiliary voltage is generated by a power converter.

24. A method as claimed in claim 23 wherein said power converter comprises a half-bridge inverter including two switches that are switched at high frequency to generate a pulse-width-modulated (PWM) waveform as an output.

25. A method as claimed in claim 24 further comprising filtering the output of the half-bridge inverter to produce said auxiliary voltage.

26. A method as claimed in claim 24 wherein the magnitude of the auxiliary voltage is controlled by setting the DC link voltage of the half-bridge inverter.

27. A method as claimed in claim 26 further comprising maintaining the magnitude of the DC link voltage at a desired value.

28. A method as claimed in claim 23 wherein the power converter is a full-bridge converter.

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